Immersion heater device for aquariums and the like

Technical field of the invention

The present invention relates to an immersion heater device for aquariums and the like, according to the preamble of the principal claim.

Technological background of the invention

Immersion heater devices of the above-described type are mainly used, though not exclusively, for regulating the temperature of water inside aquariums so as to reproduce the conditions of the natural habitat of fishes placed therein.

These devices, which are generally supplied with electrical energy, must comply with strict safety provisions since they are potentially handled by the user during the normal maintenance of the aquarium. In particular, the standards in force in some countries require that the elements be subjected to various strength and resistance tests, such as mechanical strength (for example, resistance to collisions or impacts) and heat resistance (for example, resistance to thermal shock), therefore imposing very precise structural features.

Most of the known devices comprise a glass casing in contact with the water, containing the electrical resistor which can heat the water by radiation. However, glass presents some disadvantages, such as the possibility of being easily broken as a result both of accidental collisions against elements placed inside the aquarium (such as stones, rocks, etc.) and thermal shocks produced, for example, by the immersion in water of a device, a device which has accidentally been left switched on out of the water, or by filling the aquarium with cold water. In order to prevent breakages owing to thermal shock, safety thermostats are generally provided in the glass devices; these interrupt the energy supply of the resistor when a particular predetermined temperature value is reached at the surface of the casing. However, the provision of such a thermostat in order to ensure correct operation of the device when it is immersed in water, involves an increase in the longitudinal dimensions of the casing, making the device costly and bulky.

There are also known heating devices which have a metal casing, but which need to be connected to earth in order to comply with the safety stan-

dards, and which further involve a high cost in comparison with the glass devices owing to the material used.

An example of this prior art is disclosed in FR-A-2401585.

Finally, a device having a casing of plastics material is known from Italian patent no. 1300229. This device has never been marketed, however, since it is not suitable for withstanding high temperatures, such as, for example, those reached by the device should it remain live out of the water, at which temperatures the plastics material softens. It is possible to overcome this disadvantage by producing the casing from heat-resistant plastics materials, such as thermo-resistant resins, which have the disadvantage, however, of high cost.

Description of the invention

The problem addressed by the present invention is to provide an immersion heater device for aquariums and the like which is structurally and operationally designed to overcome the limitations set out above with reference to the prior art cited.

This problem is solved by the present invention by means of an immersion heater device for aquariums and the like which is produced according to the claims below.

Brief description of the drawings

The features and advantages of the invention will be better appreciated from the description below of one preferred embodiment which is illustrated purely by way of non-limiting example with reference to the appended drawings, in which:

- Fig. 1 is an exploded view of an immersion heater device produced according to the invention;
- Fig. 2 is a perspective view of the heater device of Fig. 1;
- Fig. 3 is a sectioned side view of the heater device of Fig. 1;
- Fig. 4 is a sectioned view to an enlarged scale of a detail of the heater device of Fig. 1.

Preferred method of carrying out the invention

With reference to the Figures, an immersion heater device for aquariums and the like which is produced according to the present invention is generally indicated 1.

The device 1 comprises a casing 2 which includes a first element 3, having a cylindrical tubular form which is closed at one end 3a and which is open at the axially opposite end 3b, and which defines an outer surface 4 of the device 1 which can be placed in contact with water.

There is further defined inside the tubular element 3 a space 5 which can house a heating element 6, in particular one or more electrical resistors, which, when supplied with current, produce the heat necessary for heating the water of the aquarium, in which the device 1 is immersed.

The heating element 6, which is of cylindrical form and which is arranged co-axially relative to the first tubular element 3, comprises, at one end thereof, two electrical contacts 6a, 6b for the electrical connection thereof to energy supply means (not illustrated and known *per se*).

According to a principal feature of the invention, the tubular element 3 comprises a layered structure which is formed by a first metal layer 8 and by a second layer of plastics material 9. In particular, the metal layer 8 is interposed between the layer of plastics material 9 and the heating element 6 so that the heat produced thereby is diffused in a uniform manner by the metal layer 8 and the layer of plastics material 9 does not reach excessively high temperatures, which would lead to the melting or softening thereof.

The metal layer 8, which is preferably produced from aluminium, completely surrounds the heating element 6 forming a continuous wall and is of tubular form. The longitudinal extent thereof is equal to or greater than the longitudinal extent of the heating element 6 so as to cover it and completely shield all of the radiating surface thereof.

The layer of plastics material 9 is preferably produced from resin which is reinforced with glass fibre, preferably polyamide 6, 6,6, or 12.

There is further provision for interposing, between the heating element 6 and the metal layer 8, a third layer 21 of heat-resistant electrically insulating material, for example, of mecanite, on a vitreous or silicon support, in order to prevent short-circuits owing to accidental contacts between the electrical resistor and the metal layer 8. As an alternative, the heating element 6 may be produced from insulating material, such as a ceramic support, and may comprise tubular slots, in which the electrical resistors are received with complete electrical insulation from the metal layer 8.

The casing 2 further comprises a second tubular element 10 having a cylindrical form which is open at both of the two axially opposite ends 10a, 10b thereof. The tubular element 10 is advantageously produced from a transparent plastics material, for example, polyamide, and can be connected at one end 10a thereof to the open end 3b of the first tubular element 3.

The joint between the first tubular element 3 and the second tubular element 10 is produced by means of a mechanical form-fit having a form comprising a plurality of undercut recesses 25 in the outer surface of the second tubular element 10 in the region of an annular narrowing 26 at the end 10a thereof. A corresponding plurality of engaging teeth 27, which project axially from the first element 3, are snap-fitted in the recesses 25.

The leak-tightness is brought about by annular seals 28 between mutually fitting portions 29, 30 at the end 10a of the second element 10 and at the end 3b of the first element 3, respectively. This mechanical connection is of the permanent type since it cannot be released without suitable tools.

A threaded joint is also provided for.

As an alternative and/or in addition, the mechanical sealing can be brought about by means of ultrasonic welding. It should be noted that, if both the first tubular element 3 and the second tubular element 10 are produced from polyamide, these elements are compatible with each other from the point of view of welding.

The free end 10b of the second tubular element 10 is then closed in a leak-tight manner by means of a plug 20.

A space 12 defined in the second tubular element 10 receives a thermostat 13 for regulating the temperature of the water inside the aquarium. The thermostat 13 itself comprises means for setting the temperature 14 which are controlled by a rotatable knob 15 positioned on top of the plug 20.

The means 14 comprise a window 16, at the edges of which a scale 17 graduated, for example, in °C and/or °F, is depicted and inside which a column-type indicator 18 is positioned.

The space 12 further receives means for limiting the temperature (not illustrated), including another thermostat for interrupting the energy supply to the heating element 6 in the event that the temperature of the first tubular element 3 or the second tubular element 10 exceeds a given limit value.

When in use, the heating device 1 is immersed in water as far as a level indicated by a mark 19 made on the second tubular element 10 near the end 10b thereof.

By rotating the knob 15 as described above, the desired temperature is set. The water is brought to the predetermined temperature by radiation from the electrical resistor of the heating element 6.

The heat radiated by the resistor, which can reach temperatures of the order of from 200 to 300°C, is diffused in a substantially uniform manner by the metal layer 8 and therefore reduces the temperature to from 50 to 100°C in the interface zone with the layer of plastics material 9. The layer of plastics material 9 further acts as electrical insulation and it is therefore unnecessary to provide an earth connection for the device 1.

Therefore, the invention solves the problem addressed by allowing a number of advantages over the prior art referred to.

A first advantage provided by the device according to the invention is that of extreme safety provided by a casing which is produced from plastics material and which is therefore particularly resistant to collisions and thermal shocks and which, owing to the provision of the metal layer, can also be used at high temperatures without softening.

The provision of the metal layer also imparts to the device greater mechanical strength than a device of plastics material or glass.

The metal layer further allows correct and uniform operation of the safety thermostat.

Not least, the provision of a casing of plastics material allows simple production thereof in a great variety of shapes and forms.